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Two New Species of *Plocamopherus* from the Western Warm Water Atlantic

by

JEFFREY C. HAMANN

475 W. Bradley Avenue, El Cajon, California 92020, U.S.A.

AND

WESLEY M. FARMER

3591 Ruffin Road, No. 226, San Diego, California 92123, U.S.A.

Abstract. Two new species of *Plocamopherus* (Mollusca: Gastropoda: Opisthobranchia) from the western warm water Atlantic are described and their unique features are discussed. *Plocamopherus gulo* Marcus, 1979, is reascribed to the genus *Kaloplocamus* Bergh, 1892.

INTRODUCTION

There are presently 14 species of *Plocamopherus* described from tropical and subtropical waters. THOMPSON (1975) proposed recognizing only six of these species and certainly some will prove to be indistinct with further study. Only one, *Plocamopherus maderae* (Lowe, 1842), is reported from the warm water Atlantic. Two new Atlantic species are discussed in the following description representing a significant addition to a sparsely represented and poorly documented genus.

Family POLYCERIDAE Thiele, 1931

Genus *Plocamopherus* Rüppell & Leuckart, 1831

Plocamopherus ***lucayensis*** Hamann & Farmer, sp. nov.

(Figures 1–6)

Etymology: The area in which this species was collected was at one time occupied by the Lucayan Indians. The names of many local landmarks refer to this heritage and it was for this reason the name ***lucayensis*** was chosen.

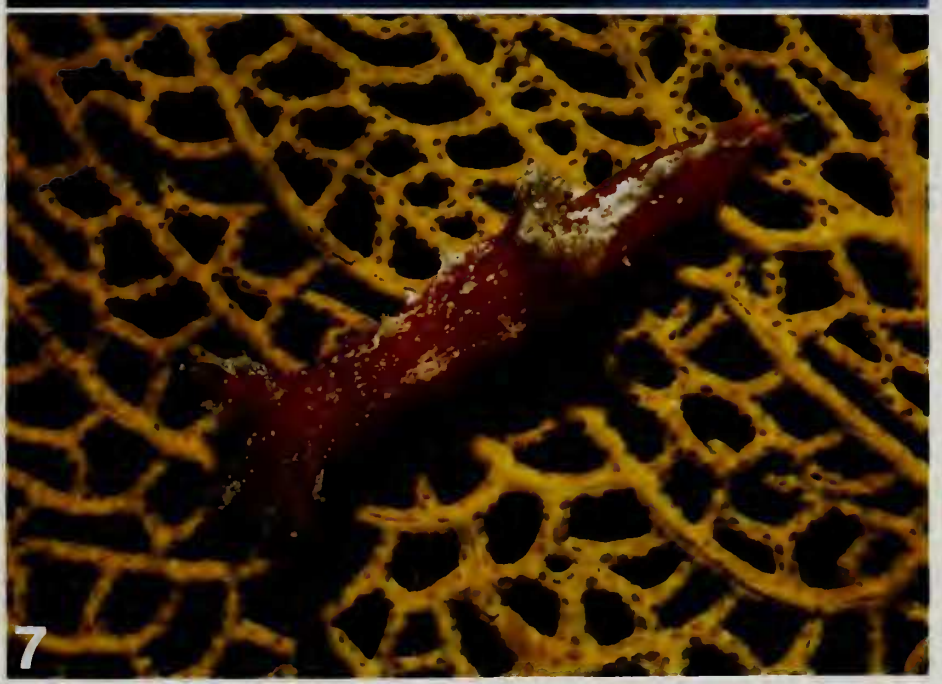
Material examined: Eight specimens were collected by Jack Worsfold in June 1984. The living animals were up to 40 mm long and were found feeding on a bryozoan of the family Bugulidae. The brown bryozoan colonies hung in loose spirals up to 75 cm long. The specimens were found on the underside of floating boat docks in the Bell Channel Canal, 0.5 mile (0.8 km) east of the Bell Channel entrance, Grand Bahama, Bahamas (26°31′40″N, 78°37′60″W).

Holotype: (1) One specimen (16 mm long preserved) is deposited in the collection of the California Academy of Sciences, Department of Invertebrate Zoology, San Francisco, California, CAS 064679. A color transparency and a sample of the bryozoan prey (CAS 064679) are on file with the holotype.

Paratypes: (2) One specimen (12 mm preserved) is deposited in the CAS collection, CAS 064677. (3) One specimen (9 mm preserved) is deposited in the CAS collection, CAS 064678. (4) One mounted radula is deposited in the CAS collection, CAS 064710. (5) One specimen (16 mm preserved) is deposited in the National Museum of Natural History, USNM 859307. (6) One specimen (10 mm preserved) is deposited in the National Museum of Natural History, USNM 859308.

Description: The body is a uniform reddish orange (Mars Orange from lefranc & bourgeois color chart) with white-tipped, tapering papillae of various sizes placed randomly over the entire dorsal surface. The tips are translucent white (Figure 1).

Most of the papillae bear a dark brown subapical band. They occur at a rate of approximately 124 per cm^2 on a 40-mm specimen with a decrease in density approaching the edge of the foot. The largest papillae are 1 mm long and 0.3 mm in diameter at the base, but most are considerably smaller.



Explanation of Figures 1 and 7

Figure 1. *Plocamopherus* ***lucayensis*** Hamann & Farmer, sp. nov. Photograph by Jack Worsfold.

Figure 7. *Plocamopherus* ***pilatecta*** Hamann & Farmer, sp. nov. Photograph by Jeff Hamann.

The general body shape is long and cylindrical, tapering to a blunt tail. Midway between the rhinophores and the branchial plume, the body is 7 mm wide by 7 mm high in a 40-mm specimen. There is no hint of a notal rim (Figure 2).

The foot has a thin edge that projects laterally approximately 1 mm. The anterior border of the foot is bilabiate and the corners form two enrolled propodial tentacles. The tentacles end in a blunt point 2–3 mm from the foot (Figure 3). They are the same Mars Orange color as the body and

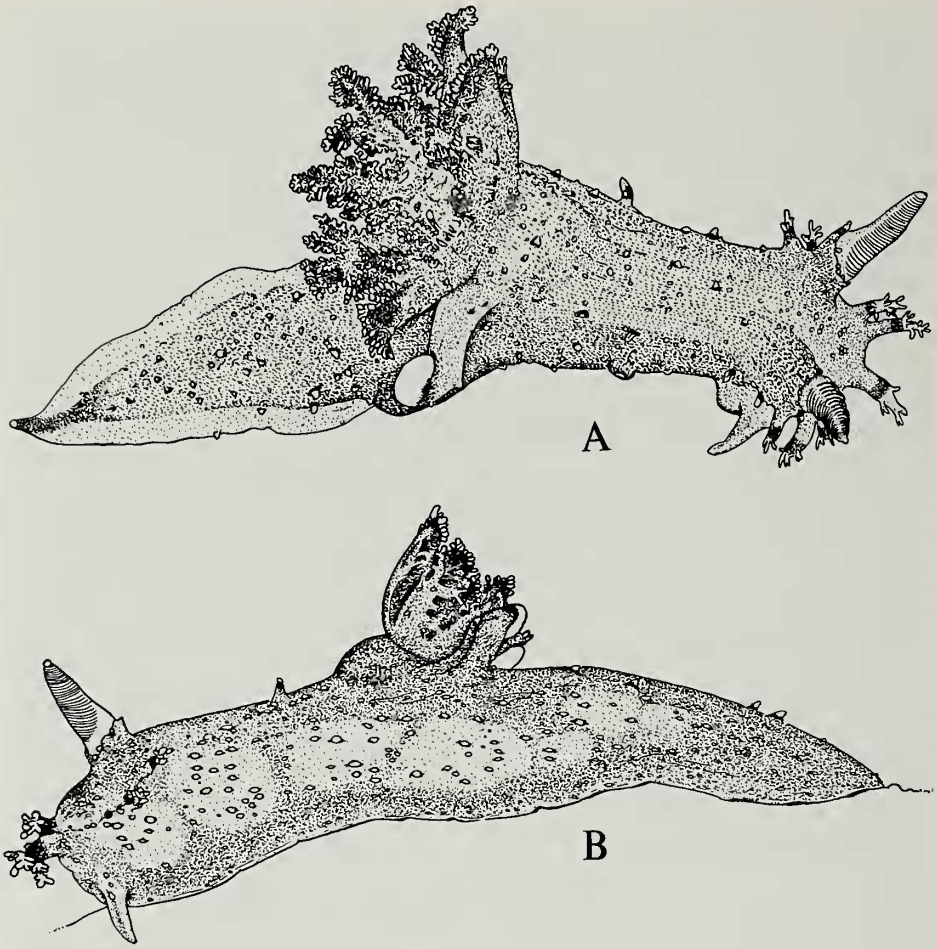


Figure 2

Plocamopherus ***lucayensis*** sp. nov. A. Right dorso-lateral view. B. Left lateral view. Length 40 mm.

are visible from most anterior angles. The tail tapers to a blunt point and has a dark brown ridge.

The frontal veil bears 8–10 unevenly spaced processes up to 2 mm long. The distal one-third of each process is translucent white and irregularly branched. The white tips are followed by a poorly defined dark brown band as in the dorsal papillae.

The finely lamellate rhinophores have 33 lamellae that closely approach the rhinophoral sheath. The rhinophores are orange with increasing dark brown shading approaching a minute white tip. The clavus tapers evenly from 2 mm at the base to a blunt tip and is 5 mm long on a 40-mm specimen. The rhinophoral sheaths are rimmed in dark brown and lined with papillae following the same color pattern as the dorsal papillae.

The large branchial plume has 6 or 7 bipinnate and tripinnate gills, the anterior 3 being slightly larger. The same Mars Orange color covers all but the very ends of the gills, which shade into dark brown with translucent white tips. The six gills are arranged in a horseshoe around the anus (Figure 4). One 1.5 mm wide by 6 mm long extrabranchial appendage is fixed just under the gills on each side about two-thirds of the way back from the anterior gill. The distal one-third of these cylindrical processes consists of an opaque white hemisphere that is directed posteriorly. This 2-mm bulb is very prominent and ringed with dark brown.

Although many species of *Plocamopherus* are reported to have light-emitting and swimming capabilities, neither behavior was observed in this species.

Radula: The radula is long and narrow with a bare rachis. The radular formula is 9 × 3·2·0·2·3. The two inner laterals are distinctive hooks, while the three remaining outer laterals are simple blades. The first lateral tooth has a wide base and the second has a small point on top of the hook (Figure 5). The radula is dark amber in color. The jaw plates are clear and roughly triangular in shape with a smooth texture.

Reproductive system: The genital pore is located on the right side of the body one-half of the way from the rhinophore to the extrabranchial appendage and 2 mm below a line drawn between the two.

The reproductive system (Figure 6) is triaulic and the

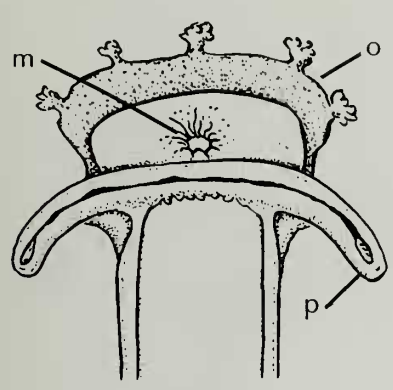


Figure 3

Ventral view of head region of *Plocamopherus* ***lucayensis***. m, mouth; o, oral veil; p, propodial tentacles.

penis is armed with many small spines. In the penial sheath there are pointed fleshy papillae. The non-prostatic portion of the vas deferens is long and convoluted. The prostatic portion envelops the bursa copulatrix with coils of flat tubes. The bursa copulatrix is smooth and spherical.

The female reproductive system is serially arranged following the terminology of ODHNER (1926). The vagina is smooth and thin walled. It inflates slightly and turns before narrowing to enter the bursa copulatrix. The distal vaginal duct emerges from the bursa copulatrix at some distance from the entrance of the vagina. It traverses a distance equal to the length of the bursa copulatrix and then enters the receptaculum seminis. The short uterine duct connects the receptaculum seminis to the female gland mass.

Plocamopherus ***pilatecta***
Hamann & Farmer, sp. nov.

(Figures 7–12)

Etymology: The specific name chosen for this *Plocamopherus* is a compound of the Latin words *pila,* meaning "ball," and *tecta,* meaning "covered." One of the characteristics of this genus is the extrabranchial appendages, which terminate in a globular structure. These appendages are almost completely hidden by accompanying arborescent processes and the branchial plume in this species.

Material examined: Three specimens were examined altogether. Two specimens were collected by Gregg Hamann in the Grenadines of St. Vincent, West Indies, in March

Figure 4

Schematic drawing of gill arrangement around anus in *Plocamopherus* ***lucayensis***.

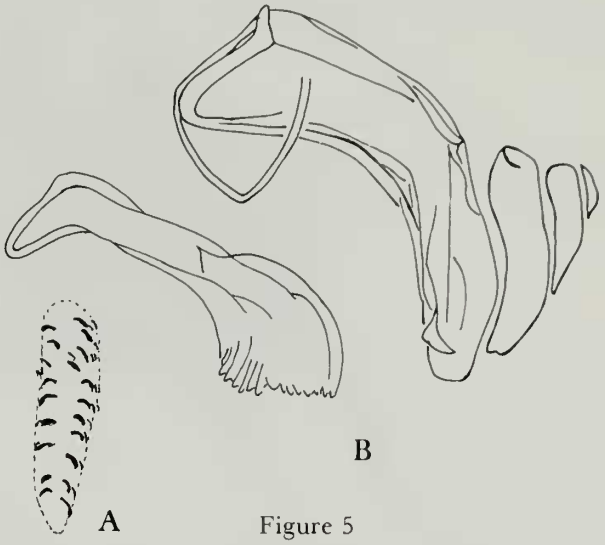


Figure 5

Radula of *Plocamopherus* ***lucayensis***. A. Schematic drawing showing shape of radula. B. Half row of teeth.

of 1987. The third specimen was collected by Jeff Hamann on Guadeloupe, West Indies, in January 1986.

Holotype: (1) One specimen approximately 28 mm long alive (17 mm preserved) is deposited in the collection of the California Academy of Sciences, Department of Invertebrate Zoology, San Francisco, California, CAS 064680. The specimen was collected at Princess Margaret Beach, Bequia, Grenadines of St. Vincent (12°59′40″N, 61°15′14″W). It was found at night in 21 m of water feeding on the bryozoan *Zoobotryon vericillatum* Delle Chiage.

Paratypes: (2) The second specimen, collected with the holotype and measuring approximately 24 mm alive (15 mm preserved), is also deposited in the CAS collection, CAS 064681. (3) The third specimen (12.5 mm live, 6

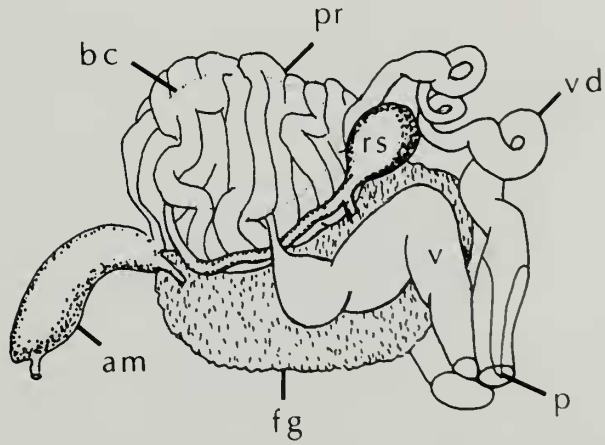


Figure 6

Reproductive system of *Plocamopherus* ***lucayensis***. am, ampulla; bc, bursa copulatrix; fg, female gland mass; p, penis; pr, prostate; rs, receptaculum seminis; v, vagina; vd, vas deferens.

Figure 8

Plocamopherus ***pilatecta*** sp. nov. Right dorso-lateral view. Length 12.5 mm.

mm preserved) was collected in 20 m of water between Pt. Botrel and Pt. Mahout on the west coast of Guadeloupe, West Indies (16°11′N, 61°47′50″W). The bottom was muddy owing to a nearby river mouth and the specimen was found at night feeding on *Zoobotryon vericillatum*. This partially dissected specimen, along with its mounted radula, is deposited in the collection of the National Museum of Natural History, Washington, D.C., USNM 859309.

Description: The three specimens examined varied in color from yellow to yellow-ochre to orange. A creamy white irregular band runs around the frontal veil, along the notal ridges, and down the ridge of the tail. A frosting of the same color occurs on the dorsum and the sides of the body. Four or five white papillae occur on each side in a line midway between the notal rim and the edge of the foot. The entire animal is translucent enough to see vague interior features. Two eye spots are visible 2 mm behind the rhinophores and 1 mm apart (Figure 7).

The general body form is long and cylindrical. The 12.5-mm specimen was 3 mm wide and 3 mm high midway from the rhinophores to the branchiae. The notal rim has three pairs of arborescent processes up to 2 mm long. Two pairs occur between the branchiae and the rhinophores and one pair occurs behind the branchiae at the posterior notal corners. They are creamy white like the notal bands. The posterior pair is accompanied by cylindrical processes typical of the genus. These well-hidden extrabranchial appendages are 2 mm in diameter and 4 mm long in a 27-mm specimen with a pink or white hemisphere on the end. Rudiments of additional processes are apparent on the dorsal ridge running down the tail (Figure 8).

The frontal veil on the 27-mm specimen has 7 or 8 larger arborescent processes and many smaller ones. Fully expanded, the frontal veil is 9 mm wide on a 27-mm specimen. The oral tentacles are triangular and pointed laterally (Figure 9).

The white-tipped rhinophores are the same color as the body and are dusted with white and brown in varying amounts. They have 11 or 12 lamellae. The bare stalk is about the same length as the lamellate portion of the rhinophore.

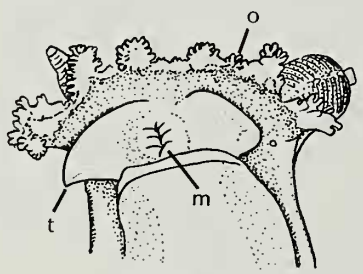


Figure 9

Ventral view of head region of *Plocamopherus* ***pilatecta***. m, mouth; o, oral veil; t, oral tentacles.

Figure 10

Schematic drawing of gill arrangement around anus of *Plocamopherus* ***pilatecta***.

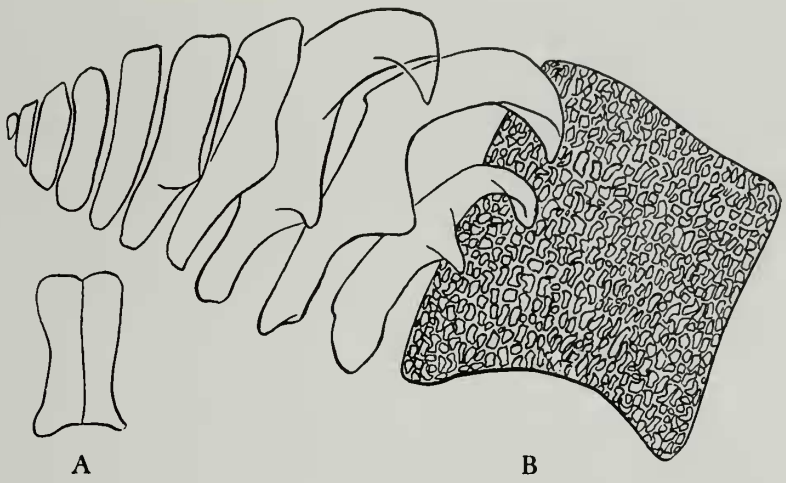


Figure 11

Radula of *Plocamopherus* ***pilatecta***. A. Schematic drawing showing shape of radula. B. Half row of teeth, and granulated rachis.

The branchial plume is composed of three finely branched, tripinnate gills wrapped around the anus (Figure 10). They are creamy white like the frontal veil and notal ridge.

The foot is rounded anteriorly and sharply pointed posteriorly. It is colored a uniform light orange or yellow. A thin edge of the foot extends laterally 1 mm on a 27-mm specimen.

The animal swims in a lateral head to tail motion. It flattens its tail vertically while swimming. When disturbed, the white portions of the body emit a green-white light visible in daylight shadows. This response was observed only twice in the course of a week's captivity. Light organs are not uncommon in *Plocamopherus* and have been reported in *P. imperialis* Angas, 1864, by Willan & Coleman (1984), in *P. tilesii* Bergh, 1877, by Bertsch & Johnson (1981), and in *P. maderae* (Lowe, 1842) by Risbec (1928). The luminous organ in *P. tilesii* is discussed in detail by Okada & Baba (1938).

Radula: The narrow radula has a formula of 12 × 7·3·0·3·7 in a 12.5-mm specimen and 16 × 10·4·0·4·10 in a 24-mm specimen. The bare rachis is wide with a granulated membrane. The inner lateral teeth of each row are hook-shaped with a low cusp on the shank. The next two or three lateral teeth are flat blades with a similar low cusp on the shank. The remaining five to seven teeth are simple blades (Figure 11). The jaw plates are roughly triangular and yellow.

Reproductive system: The penis is surrounded by a heavily muscled penial duct. There is a large inflation on the vas deferens before it narrows and enters the tightly coiled prostatic portion.

The female reproductive system is serially arranged following the terminology of Odhner (1926). The vagina makes two turns before widening into a long section with longitudinal striations. From there, it narrows and enters the spherical bursa copulatrix. The distal vaginal duct exits the bursa copulatrix near the vaginal duct and after a long smooth section branches off to the receptaculum seminis. The shorter, convoluted uterine duct continues on to the female gland mass (Figure 12).

Discussion: *Plocamopherus* Rüppell & Leuckart, 1831, belongs to the family Polyceridae Theile, 1931. Risbec (1928) united *Triopha* Bergh, 1880, with *Plocamopherus* but the synonymy has largely been rejected among subsequent workers. *Plocamopherus* is differentiated from *Triopha* by the presence of club-shaped extrabranchial appendages (Ferreira, 1977). Eliot (1906) characterized *Plocamopherus* as having branched processes on the oral veil and dorsal margin, flat ridge-like oral tentacles, a bare

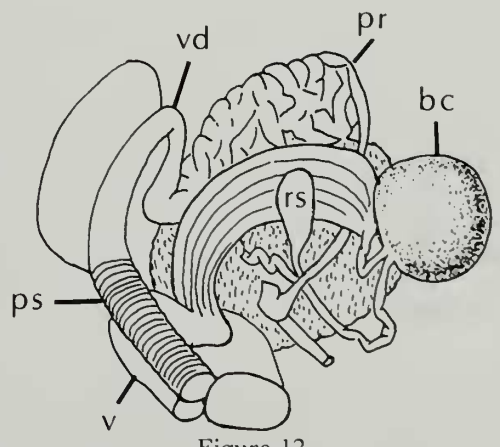


Figure 12

Reproductive system of *Plocamopherus* ***pilatecta***. bc, bursa copulatrix; pr, prostate; ps, penial sheath; rs, receptaculum seminis; v, vagina; vd, vas deferens.

wide rachis of the radula, 3–11 inner hamate teeth, flat plates for outer teeth, and a dendritic prostate enveloping the spermatotheca. PRUVOT-FOL (1954) added that most species have clublike or spherical processes that are light-emitting. RISBEC (1953) identified a voluminous prostate and armed penis as being representative of the genus.

THOMPSON (1975) briefly reviewed the genus and listed six valid species. MARCUS (1979) listed 14 species of *Plocamopherus* and described a new species. *Plocamopherus gulo* Marcus, 1979, fits into the genus *Plocamopherus* in most respects but lacks the clublike or spherical extra-branchial appendages and should be placed in the genus *Kaloplocamus* Bergh, 1892. *Kaloplocamus* can be differentiated from *Triopha* by the presence of branched notal processes, versus simple processes in *Triopha.*

Although *Plocamopherus* ***lucayensis*** resembles the 14 presently described species of *Plocamopherus* in general body form it can be differentiated by the following characteristics: (1) None shares a total lack of notal rim and notal processes. (2) Only *P. tilesii* Bergh, 1877, is recorded as sharing brown or amber radula. (3) *P. maderae* (Lowe, 1842), *P. tilesii* Bergh, 1877, *P. ceylonicus* (Kelaart, 1858), *P. maculatus* (Pease, 1860), *P. ocelatus* Rüppell & Leuckart, 1831, *P. imperialis* Angas, 1864, and *P. apheles* Barnard, 1927, are recorded as having a crested tail for swimming. *Plocamopherus* ***lucayensis*** has no hint of a crested tail. (4) No other *Plocamopherus* is recorded as having tentacular foot corners. (5) At 9 × 3·2·0·2·3, the radula of *P.* ***lucayensis*** is narrower than any of the other species. *Plocamopherus fulgurans* Risbec, 1928, is the closest at 25 × 7·3·0·3·7.

Plocamopherus ***pilatecta,*** on the other hand, is more typical of the genus, with flat oral tentacles, a crested tail, and well defined notal rim with processes. It most closely resembles the Atlantic species *P. maderae.* These two species can be differentiated by the following characteristics. (1) *P. maderae* has 15 large oral processes while *P.* ***pilatecta*** has 7 or 8 large processes. (2) *P. maderae* is red-orange with bright red, yellow, and brown spots while *P.* ***pilatecta*** is orange with cream-colored irregular frosting. (3) Both species have a wide bare radular rachis. In *P.* ***pilatecta*** the membrane of the rachis is granulated. In *P. maderae* it is divided by transverse lines connecting the teeth on each side. (5) The rhinophores in *P.* ***pilatecta*** are club-shaped with an equal plain shaft section and lamellate section, while the rhinophores in *P. maderae* are fully lamellate with no bare shaft. (6) Internally, the prostate envelops the bursa copulatrix in *P. maderae* but is separate in *P.* ***pilatecta.***

ACKNOWLEDGMENTS

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